NREL FY 2007 Business and Operating Performance

A national laboratory of the U.S. Department of Energy
Office of Energy Efficiency & Renewable Energy

National Renewable Energy Laboratory

Innovation for Our Energy Future

Foreword

The Laboratory's Mission:

NREL develops renewable energy and energy efficiency technologies and practices, advances related science and engineering, and transfers knowledge and innovations to address the nation's energy and environmental goals.

The National Renewable Energy Laboratory (NREL) is a U.S. Department of Energy (DOE) science and technology facility whose mission is to advance renewable energy, energy efficiency, and related technologies and practices. NREL is managed and operated by the integrated Midwest Research Institute (MRI) and Battelle management team, and is a partner and strategic advisor to DOE's Office of Energy Efficiency and Renewable Energy (EERE).

NREL conducts focused research to advance renewable electricity and fuels technologies to apply these resources efficiently in buildings and vehicles. The Laboratory places a strong emphasis on technology transfer and on strengthening the interfaces between basic science, applied research and development, and technology deployment in order to accelerate market adoption of these important technologies. Work at the Laboratory promotes the nation's energy security while minimizing environmental impacts—all in a manner that supports enhanced economic productivity. NREL's highly skilled staff support multidisciplinary work to rapidly translate energy-related scientific discoveries into new knowledge and technical innovations.

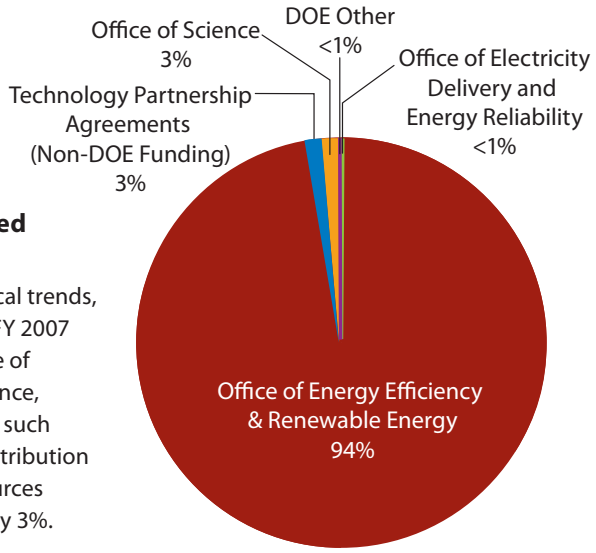
Strong, cost-effective business and operational management is a key enabler of NREL's science and technology mission. NREL consistently strives to be the best-value provider to DOE, delivering a business management and operational infrastructure that is efficient, effective, and responsive, and that maximizes R&D output per dollar invested at the Laboratory. This report profiles the management, delivery, and continuous improvements that enable mission success.

Contents

NREL's Core Mission and FY 2007 Budget

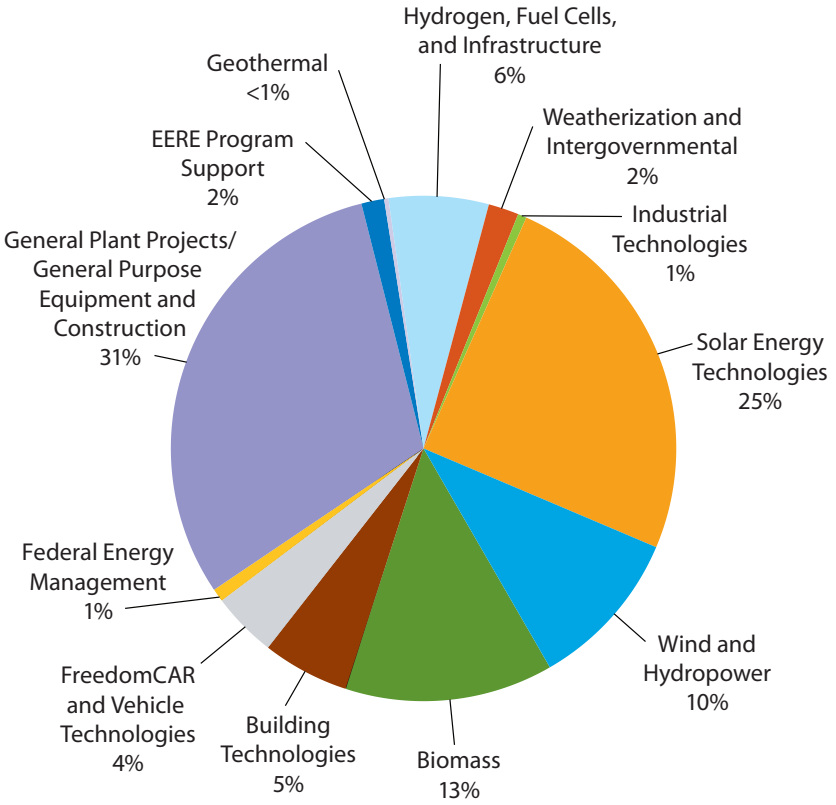
As DOE's primary laboratory for renewable energy and energy efficiency technology, NREL provides expertise across the continuum of research, development, and demonstration and supports implementation strategies to accelerate market adoption. These efforts are underpinned by highly effective program management, yielding significant outcomes that advance the nation's energy goals. In FY 2007 NREL received 94% of its total funding from EERE, the Laboratory's steward and primary sponsor. Work with DOE's Office of Science (3% of funding) promotes fundamental research in areas that will lead to breakthrough technologies and scientific advances in energy efficiency and renewable energy. Additional funding came from the DOE Office of Electricity Delivery and Energy Reliability and other offices. Technology Partnership Agreements with non-DOE sponsors represent 3% of the Laboratory's total budget. In partnership with EERE, NREL supports 10 programs by conducting research and development to advance renewable energy and energy efficiency technologies, providing technical assistance to support the application of technologies, and conducting strategic analyses to inform portfolio planning, research directions, and policy formulation. The Laboratory also received a significant increase in funding for construction, which indicates the nation's commitment to further developing NREL as a national resource.

A key strength of the Laboratory is its ability to work with and for a broad range of groups outside DOE, including industry, universities, state and local governments, other federal agencies, and domestic and international nongovernmental organizations. This is accomplished through vehicles such as Memorandums of Understanding, Technology Partnership Agreements, and licenses that promote the transfer of the knowledge and technologies produced at NREL. Through these partnerships, DOE's return on investment is realized as the knowledge created is put to use in relevant markets and sectors locally, nationally, and internationally. Through cost-sharing partnerships, NREL also leverages the dollars invested at the Laboratory in support of the DOE mission.



Total FY 2007 Funded Activities

Consistent with historical trends, 97% of NREL's work in FY 2007 supported DOE's Office of EERE, the Office of Science, and other DOE sources such as the Transmission Distribution Program. Non-DOE sources provided approximately 3%.

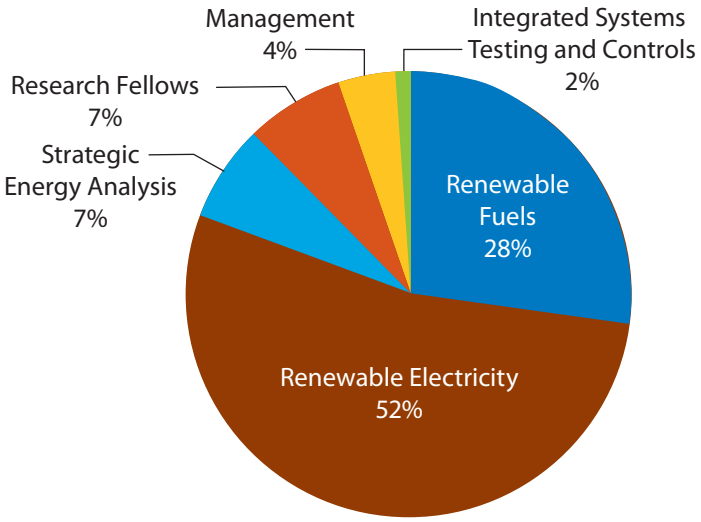


FY 2007 Funding from EERE

NREL's work spans a variety of energy resources and uses and positively impacts a broad range of energy issues. Actual FY 2007 funds received from EERE were approximately $355 million.

Science and Technology

NREL's achievements reflect key scientific and technical advances in direct support of the President's Advanced Energy Initiative. Scientific innovation and the accelerated development and deployment of market-relevant technologies continued to be hallmarks of NREL's success.



Percent of Total Dollars Invested in NREL's FY 2007 LDRD Program

The early-state concepts explored through NREL's LDRD program provide a basis for initial exploration of new technical concepts that have the potential to impact DOE goals.

As the nation's primary resource for energy efficiency and renewable energy research and development, NREL was a national force leading the response to the call for accelerated action reflected in the President's Advanced Energy Initiative. For example, NREL delivered a 75% or better xylose yield ahead of schedule in support of the 2012 Advanced Energy Initiative biofuels goal, exceeded photovoltaic efficiency targets, and enabled distributed wind technology to achieve energy costs below the targeted range. In addition, NREL's science efforts yielded results that create the potential for future breakthroughs. Examples include the first demonstration of multiple-exciton generation (the formation of more than one electron per absorbed photon) in silicon, a key class of materials used for about 90% of commercial PV production. Hydrogen production by hydrogenases adsorbed on the surface of a carbon electrode was comparable to the production from platinum catalysts and could lead to the replacement of expensive platinum. In addition, modeling that predicts thermal runaway in lithium ion cells could help battery developers design cells that are more tolerant of extreme conditions.

The nation realized technical dividends from a strategy to strengthen the Laboratory's science foundation and manage the interface between basic and applied research. This was demonstrated by advances in systems biology that will enable sustainable, long-term production of biofuels; modeling and experimental results that created a foundation for breakthroughs in next-generation photovoltaics; and advances in electrocatalysts that have the potential to improve fuel cell design and manufacturing.

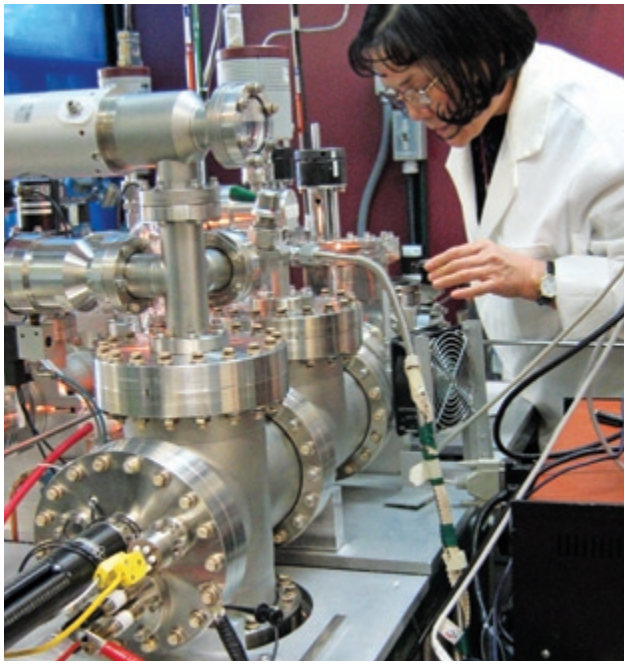
NREL's Laboratory-Directed Research and Development (LDRD) investments emphasized a strong systems perspective, market relevance, and high-impact R&D. In FY 2007, the Laboratory focused its internal investments for strategic initiatives on high-priority activities to develop enhanced capabilities in strategic analysis, energy storage, advanced biofuels, and renewable communities. These initiatives lay the foundation for future research program enhancements of importance to DOE and to the nation as we strive to meet the ever-increasing need for clean, reliable sources of energy.

NREL placed a priority on putting Laboratory knowledge and technology to work to realize national benefits, as demonstrated by a record number of licenses, cooperative research and development agreements, and work for others agreements. Significant accomplishments included

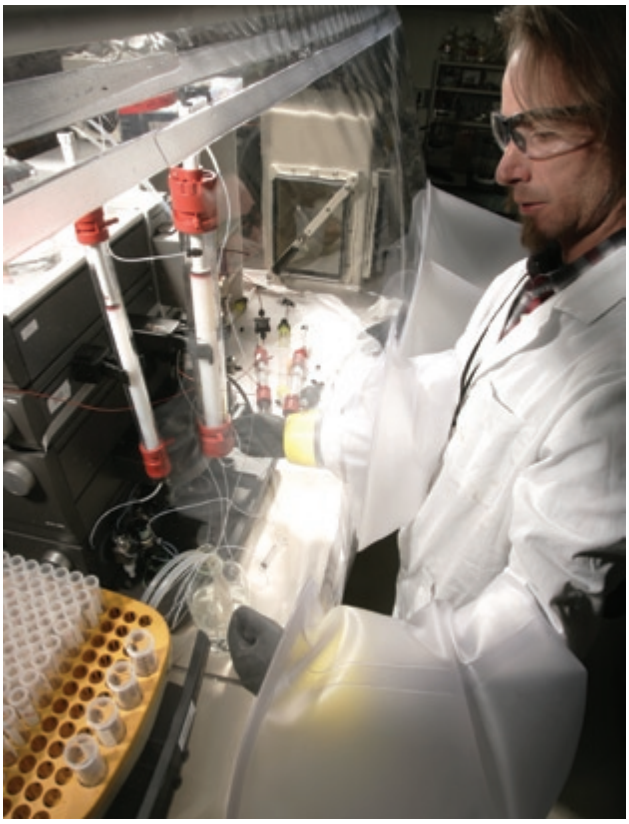
signing a three-year cooperative research and development agreement (CRADA) with Chevron to produce a suite of bio-oils from a variety of feedstocks, and establishing licenses and CRADAs with photovoltaics and battery startup companies that are scaling up and commercializing NREL-originated technologies.

In addition, NREL's technical assistance enabled smart development on the part of retail leaders such as Wal-Mart and Whole Foods, and informed policy decisions such as an Iowa executive order to increase the use of E85, and programs such as the Sacramento Municipal Utility District incentive program for zero-energy buildings. NREL's technical assistance reduced market barriers through the development of standards such as the adoption of the oxidation stability requirements for B100 biodiesel into the ASTM specification. NREL also provided credible and objective testing of commercial wind turbine prototypes to prevent field failures and help partners identify process and design changes that enhance reliability and lower costs. These efforts are removing barriers to the deployment of energy efficiency and renewable energy technologies.

Awards and recognition during the year acknowledged NREL's innovative and unique research. External awards, such as the R&D 100 Award, and prestigious awards to individual researchers were highlights. Two NREL scientists, Jerry Olson and Sarah Kurtz, were named Dan David laureates for their pioneering work on the multijunction solar cell. According to the prize committee, Olson and Kurtz were selected for their "exceptional and profound contributions to the field of photovoltaic energy." A collaboration between NREL and Boeing Spectrolab won an R&D 100 Award from the influential *Research and Development Magazine* for a record 40.7% efficient solar cell. This outstanding technical achievement is a reflection of the effectiveness of NREL's approach to integrating in-house and subcontracted R&D to yield world-class achievements and recognized leadership. In addition, the American Chemical Society honored Dr. Arthur Nozik, an NREL senior research fellow, in a special publication of the *Journal of Physical Chemistry B*. The issue paid tribute to the scientific accomplishments of the internationally respected researcher. The issue was the first to honor a scientist who performs all of his research at a national laboratory. Dr. Larry Kazmerski was also recognized by the University of Delaware, with its Boer Solar Energy Medal of Merit, as an individual who has made significant pioneering contributions to the promotion of solar energy as an alternate source of energy through research, development, or economic enterprise.



NREL uses hot-wire chemical vapor deposition to produce high-efficiency PV devices such as heterojunction cells. A heterojunction is a region of electrical contact between two different materials, such as crystalline silicon and amorphous silicon.



An NREL researcher works in a photobiology laboratory, researching the manufacturing of a hydrogenase enzyme that could be the key to producing hydrogen from sunlight.

Technology Transfer

Through technology partnerships, NREL seeks to reduce private-sector risk and enable investment in the adoption of renewable energy and energy efficiency technologies. The commercialization of these technologies in the marketplace helps displace oil, reduce carbon emissions, and increase U.S. industrial competitiveness.

At NREL's Alternative Fuels User Facility, researchers develop and test biomass conversion technologies, some of which are being commercialized.

NREL delivers its expertise in energy efficiency and renewable energy to optimize new energy product development or technology application—from design to the removal of market barriers. To transfer NREL-developed technologies into commercially viable products, the laboratory provides industry and other organizations with opportunities to create R&D partnerships, license technologies, use research facilities, and develop business connections.

Licensing NREL's intellectual property is a critical tool for commercializing the Laboratory's technologies. During FY 2007, NREL executed six new commercial licenses with leading companies in the solar and biomass sectors. These license agreements will increase the market application of photovoltaic (PV) cells within three to five years and develop a more economical pathway for biomass conversion using cellulose enzymes.

Technology partnership agreements at NREL include cooperative research and development agreements (CRADAs), analytical service agreements, technical service agreements, and work for others. In FY 2007, NREL successfully executed 99 technology partnership agreements (a 34% increase from those of FY 2006), worth $21.6 million. These agreements include commercializing biomass technologies such as bio-oil fractionization, biofuels, and biorefineries, as well as those supporting the U.S. Department of Energy's Solar America Initiative. Other technology partnership agreements helped to create two new start-up companies: PrimeStar Solar and Planar Energy Devices. PrimeStar Solar is commercializing highly efficient cadmium telluride photovoltaic modules (see page 5). Formed through a seed investment from a venture capital fund, Planar Energy Devices is commercializing a unique lithium-ion battery developed at NREL.

The 19th NREL Industry Growth Forum also helped facilitate the creation of clean energy start-up companies by introducing them to venture capitalists. Approximately 400 participants attended this year's forum. Companies that have attended past forums have raised more than $560 million in financing from the private sector.

For more information about NREL's licensing, technology partnerships, and economic development opportunities, visit the Technology Transfer Web site at www.nrel.gov/technologytransfer/.

NREL Signs $870,000 Cooperative Research & Development Agreement with PrimeStar Solar

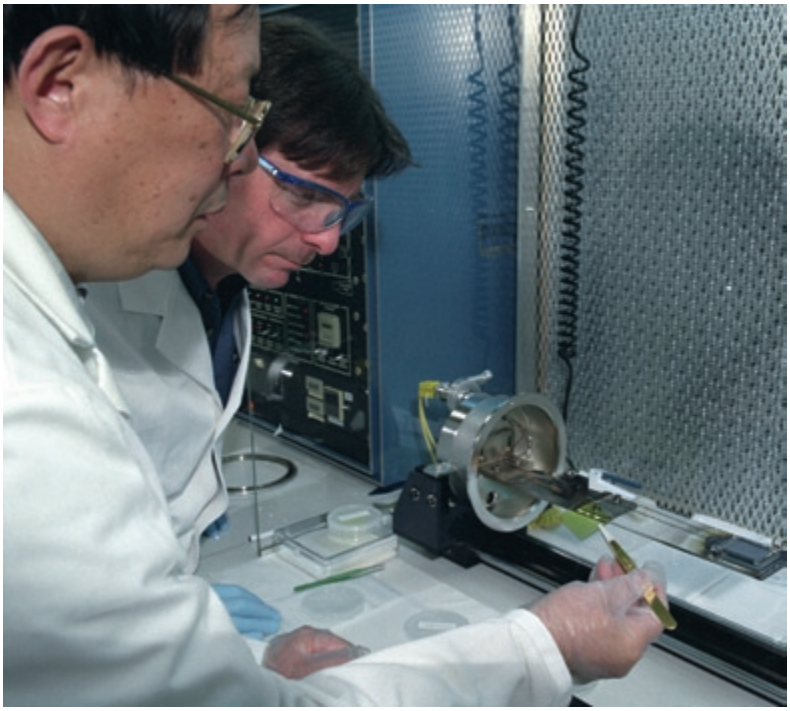
NREL and PrimeStar Solar, Inc., signed an $870,000 cooperative research and development agreement to transition NREL's leading cadmium telluride (CdTe) photovoltaic (PV) technology for commercial module production. This technology, developed at NREL, has been used to achieve a world record CdTe PV cell efficiency of 16.5%.

In addition to the technology transfer, the agreement provides PrimeStar Solar with ready access to NREL's world-class photovoltaic scientists and state-of-the-art equipment. PrimeStar Solar has leased a 16,000-square-foot facility near NREL to develop a pilot plant. CdTe processing equipment has been delivered from PrimeStar Solar's assembly facility in Michigan.

PrimeStar Solar has secured capital from individual investors, GE Energy, and a global investment bank to help fund development work. The company plans to rapidly scale up low-cost CdTe PV module production.

NREL has been researching, developing, and helping to commercialize CdTe technology for more than two decades. Brian Murphy, CEO of PrimeStar Solar, Inc., says, "The CRADA with NREL has been instrumental in accelerating our scale-up of the NREL world-record CdTe technology. We expect to have a close relationship with NREL in the form of licensing and CRADAs for many years to come."

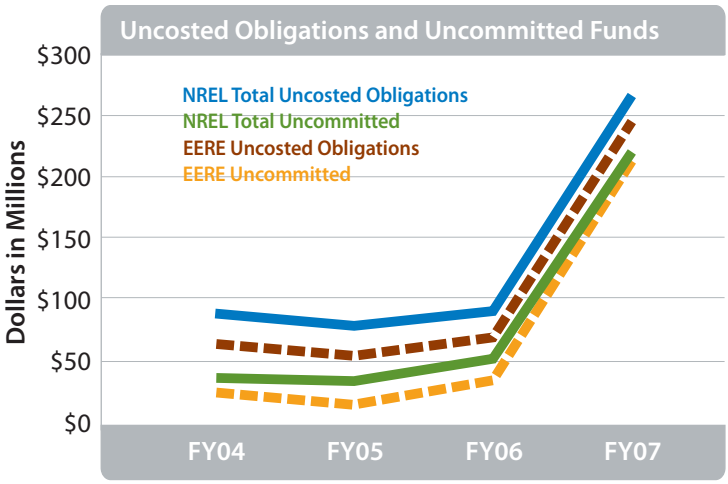
NREL's CdTe PV technology research and development supports the DOE's Solar America Initiative. The initiative strives to make solar energy cost-competitive with conventional forms of electricity by 2015. The strategy pursues complementary activities in research and development and in market transformation. The goals are to reduce costs through research and development and to eliminate market barriers through deployment.



NREL researchers test a cadmium telluride PV cell, the technology that PrimeStar Solar is commercializing.

Business Management Outcomes

The priority that NREL places on continuous improvement was evident in the continued delivery of effective business and operational support while demonstrating flexibility and agility in meeting evolving customer needs and making improvements to its management systems.



FY 2007 uncosted balances for EERE programs ensure that the Laboratory is able to continue in-house operations and meet its legal, contractual, and financial commitments; $122 million of the $243 million increase in EERE uncosted obligations for FY 2007 is the result of capital and construction funding, which will be costed in FY 2008 and FY 2009.

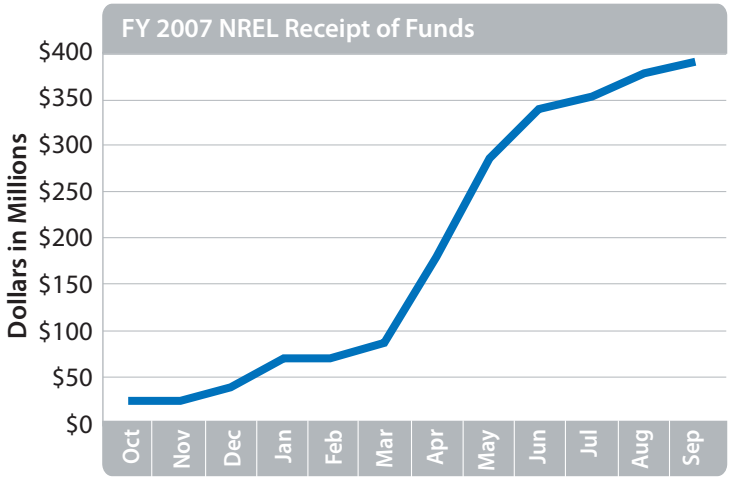
Effective financial management and enhanced oversight of funding and costs were demonstrated during the extended FY 2007 continuing resolution to manage within budget constraints and ensure continuity of operations for in-house and subcontracted efforts. Following late passage of the FY 2007 funding legislation, NREL implemented an aggressive plan to manage operations at greatly increased funding levels, rapidly increase staff, and place critical subcontracts. Throughout the year, funding was reviewed and realigned to support DOE goals and priorities. This represented a dramatic change from prior periods, during which NREL operated in an environment of stable or decreasing funding. Within this context, exemplary performance was achieved.

Excellence in financial accounting, planning, and budgeting; finance oversight; modeling; and projection capabilities enabled the Laboratory to meet target financial goals, sustain internal controls, and ensure financial accountability. NREL maintained excellent ongoing project management and greater control over daily cash balances.

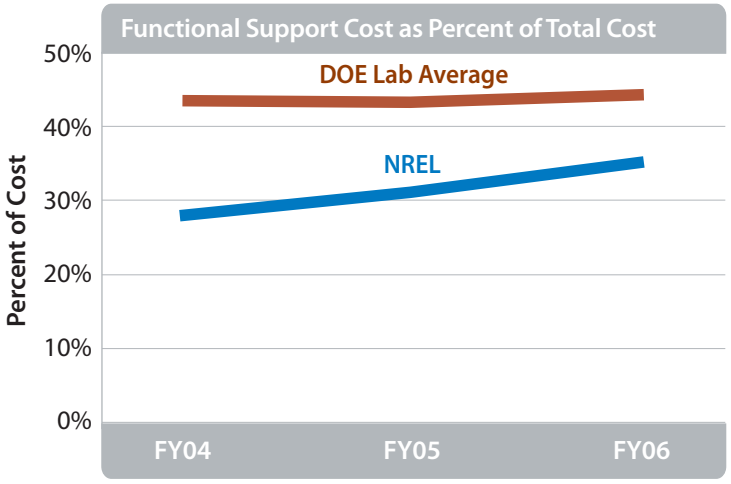
NREL's commitment to continuous improvement was demonstrated through implementation of a business systems governance process with a cross-organizational council for oversight of Laboratory business systems improvements and prioritization of projects. The Laboratory also improved the security of its business systems by establishing a more secure data enclave. NREL's investment in these cost-effective business systems has enabled significant time efficiencies, eliminated redundant processes, and dramatically improved internal controls for approvals and validations.

Financial systems continued to demonstrate effective internal controls. For example, the Laboratory met all contractor requirements under Office of Management and Budget Circular A-123 on time by implementing an aggressive schedule, accelerating documentation, and testing in response to the DOE Headquaraters requirement for a compressed completion schedule. This evaluation confirmed that NREL's established systems of internal controls are working effectively in high-, medium- and low-risk areas. The Laboratory also migrated to new cash management software, which dramatically increased internal controls over electronic payments through improved segregation of duty and oversight functionality. Effective financial oversight, rigorous reviews, and effective approval processes minimized unallowable costs that were not detected prior to audit to 0.002% of FY 2005 total costs (or less than $4,000), helping to sustain NREL's excellent record for Office of Management and Budget reporting of erroneous payments.

NREL met or exceeded all of its financial performance goals, including increased work for others closeout (by more than 200%) for improved financial management of residual funds and timely return of funds to sponsors. More than 80 technology partnership agreements were closed during this period. In addition, the Laboratory continued an aggressive, high-quality, cost-effective subcontract audit function by completing more than $100 million in cost-type audits ($25 million more than the target) to enable effective financial management of subcontracts with confirmation of allowability of costs and effective return of funds through subcontract closeouts. This achievement was reached despite a gap in Defense Contract Audit Agency support because of funding issues during the continuing resolution. NREL also achieved a first-ever 100% rate of timely foreign trip expense report closeouts.



Late receipt of funding through the first half of FY 2007, followed by a sharp increase during the last six months, presented challenges in terms of initiating and subcontracting work.



DOE conducts a study of support costs by functional activity for all contractor locations. NREL's functional costs have been less than the average of all other DOE contractors (FY 2007 data are not yet available for comparison). NREL has consistently performed better than average in controlling support costs.

Environment, Safety, and Health

NREL is committed to operating a laboratory that maximizes the efficient use of resources while maintaining a safe, healthy, and environmentally sound workplace. ES&H is a core value at the Laboratory and is reflected in its safety performance.

The Rocky Mountain Fire Authority conducted High-Angle Rescue Training for three days at the National Wind Technology Center.

Evidence of a strong safety culture is seen in many areas throughout the Laboratory. All workers are properly trained, including managers and supervisors, outside contractors, part-time and temporary employees, volunteers, researchers, and students. Training for new workers emphasizes NREL's commitment to safety. Workers are trained in safety procedures and made aware of the consequences of ignoring safety practices or engaging in unsafe behavior. In addition, the Laboratory's dedication to safety is evident in the language, customs, and behavior that take place on a regular basis throughout NREL.

NREL continuously evaluates its current practices and processes in order to maintain a high level of regulatory compliance. In FY 2007, regulatory compliance was evaluated through third-party audits, NREL-Golden Field Office combined assessments, self-assessments, and regulatory audits and inspections. A fire and life safety audit confirmed a robust fire safety program; EPA's hazardous waste audit of leased laboratories, waste storage area, and associated records resulted in no identified deficiencies. The Laboratory's environmental management system received two reviews to evaluate conformance and system effectiveness: an independent assessment by NREL's Quality Assurance staff and an external audit performed according to ISO protocols. NREL also completed a comprehensive evaluation of its Integrated Safety Management System, which included self-assessments and an independent review.

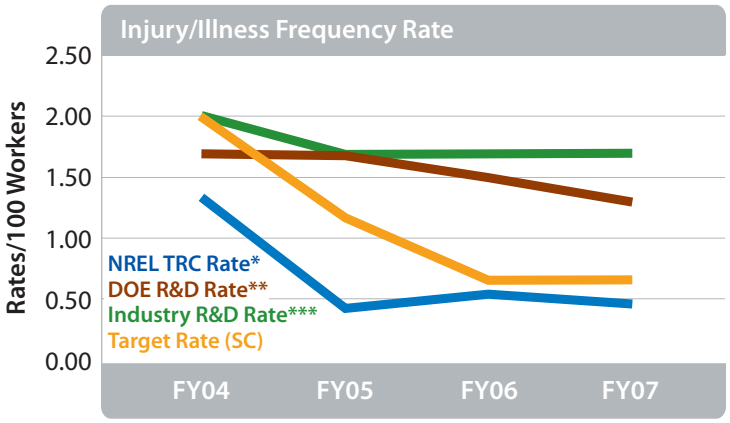
NREL continues to effectively manage ergonomics through early reporting and intervention, as indicated by the fact that ergonomic injuries and illnesses are no longer the most frequently experienced incidents at NREL. In addition, NREL uses the successful ergonomic case rate to track management of reported ergonomic concerns. For three consecutive years, 100% of all ergonomic cases at NREL have been successfully treated without the need for additional medical treatment or surgery.

Inspections are an invaluable way of identifying potential workplace hazards before they cause a health and safety problem. All NREL laboratories and non-office support areas are inspected

quarterly; offices and common areas are inspected every six months. These inspections do more than just help to identify potential hazards; they also remind staff that the Laboratory takes its responsibility for safety seriously. Complementing the Laboratory's emphasis on daily observations, inspections provide a useful opportunity to carry out a full-scale examination of all or part of the workplace.

NREL's ability to respond to chemical spills was enhanced this year when the West Metro Fire Rescue (West Metro) participated with NREL's emergency response team in two training exercises. These joint training events provided excellent learning and relationship-building opportunities for both groups. West Metro's confidence in NREL's ability to handle hazardous materials incidents increased significantly, and NREL's emergency response team learned what services West Metro can provide in a real emergency situation. Rocky Mountain Fire (RMF) conducted high-angle rescue training for three days at the National Wind Technology Center (NWTC). This annual training enables RMF to be better prepared to serve the citizens in its jurisdiction and enhances its ability to respond to high-angle emergencies that might occur at the NWTC.

Perhaps the most powerful indicator of NREL's positive safety culture is the outstanding worker performance in injury and illness prevention. NREL experienced a 13% reduction in the total recordable case (TRC) rate from that of FY 2006. NREL can be viewed as "best in class" when compared with DOE complex and R&D industry rates. As shown, NREL's TRC rate of 0.47 was 28% better than the Office of Science goal of 0.65 and 64% better than the DOE research contractor rate of 1.3. NREL's days away, restricted or transferred (DART) rate of 0.19 was 24% better than the Office of Science goal of 0.25 and 62% better than the DOE research contractor rate of 0.5.

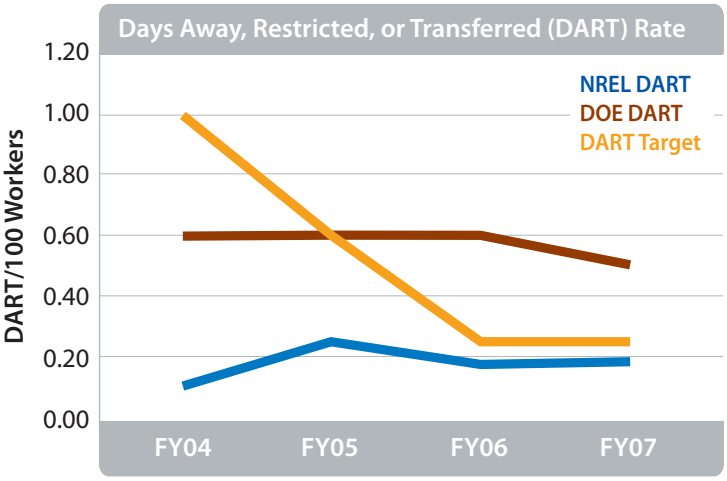


NREL emphasizes the reporting of all injuries regardless of how minor they appear to ensure they receive proper and timely medical management. Although this "over-reporting" approach can drive up the frequency rate of injuries and illnesses, NREL continually maintains an injury/illness frequency rate below that of the DOE and private industry R&D complex.

* Bureau of Laboratory Statistics (BLS) formula: number of recordable injuries/illness per 100 workers/year. Includes all NREL workers.

** BLS formula: average rate for all DOE R&D operations. Typically does not include all workers on site.

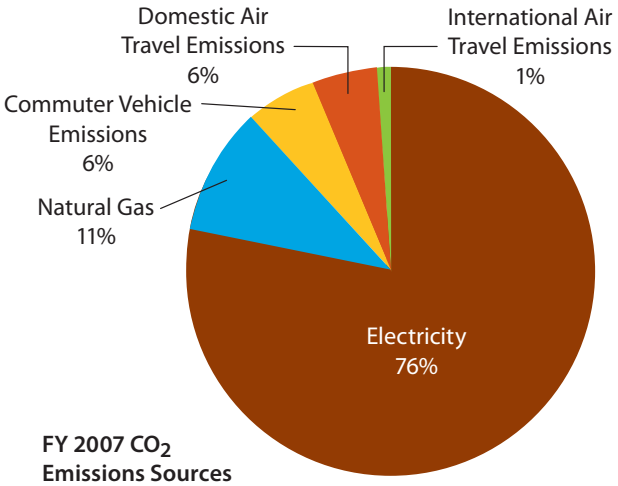
*** BLS formula; average rate for private industry R&D operations.



A DART case is a subset of OSHA recordable cases where the injury/illness is severe enough that the individual loses time away from his or her job by being away from work, on restricted duty, or being transferred to another job function because of injury. NREL's DART rate remains below both the DART target and the DOE rate.

Sustainability

NREL recognizes the importance of using minimal resources (energy, materials, water, etc.) while receiving the maximum value from those resources used—along with balancing environmental, economic, and human impacts.



FY 2007 CO_2 Emissions Sources

NREL developed its "carbon footprint" to include other indirect sources such as those associated with staff commuting. Sources with negligible emissions such as fleet vehicle emissions, solid waste disposal, and water (associated electricity or natural gas consumed) are not included in this graph.

NREL exceeded the FY 2007 Transformational Energy Action Management (TEAM) Initiative and Executive Order 13423 goals for energy use reduction, greenhouse gas reduction, use of renewable energy, and transportation. The energy use and greenhouse gas reduction goals were exceeded primarily through energy retrofits, energy-efficient new construction, and the use and purchase of renewable energy. The goal for using renewable energy was exceeded through the use of on-site projects and the purchase of renewable energy certificates. The transportation goal was exceeded through the extensive use of alternative fuel vehicles and alternative fuels.

NREL achieved "carbon neutrality" in all its operations for the second consecutive year. The Laboratory is completely offsetting its "carbon footprint," which includes electricity use, natural gas use , fleet, staff commuting, and air travel. NREL has achieved "carbon neutrality" through the use of energy retrofits, energy efficient new construction, on-site renewable projects (PV and wind), and renewable energy certificate purchases.

The new 70,000-square-foot Science & Technology Facility (S&TF) laboratory building was certified by the U.S. Green Buildings Council as a Leadership in Energy and Environmental Design (LEED) Platinum facility. LEED is the nationally-accepted benchmark for the design, construction, and operation of high-performance green buildings, and Platinum is the highest possible rating. NREL worked with the architect and construction contractor to ensure that the building met land and water use and recycling and manufacturing goals to reduce waste and emissions. In addition, architectural features such as daylighting, evaporative cooling, and efficient motors, fans, windows, and lighting reduce the building's energy requirements and save 41% in typical energy costs. The S&TF is the first federal building, one of only three laboratory-type buildings, and one of only 29 buildings of any type to be LEED Platinum certified.

The S&TF, a high-performance green building, received a LEED Platinum rating.

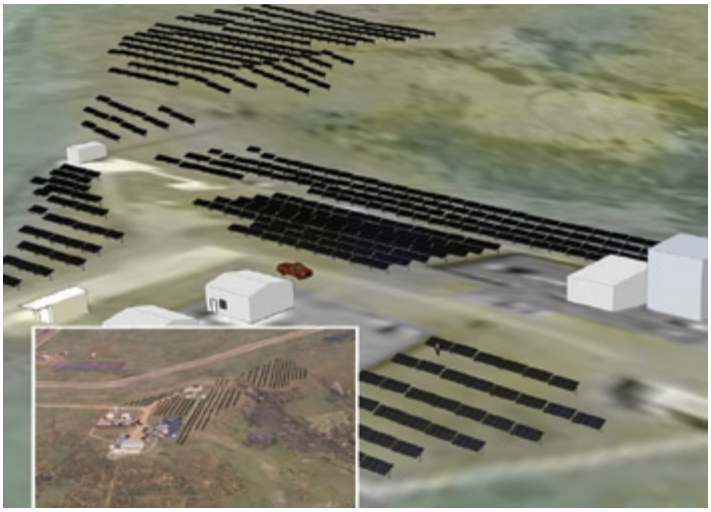
Of the Laboratory's 47 fleet vehicles, 35 use alternative fuels, representing about 75% of the total fleet. This use of alternative fuel vehicles decreased NREL's petroleum use to 5,788 gallons, substantially exceeding the DOE-mandated goal of 9,800 gallons or less. NREL has also made a major commitment to the use of bio-based fuels in its fleet. More than half of the fleet vehicles are fueled by E85 (85% ethanol), and the Laboratory is using B20 (20% biodiesel) fuel in several of its large, diesel-powered vehicles.

The next new major NREL building is the Research Support Facility (RSF), which will begin to be constructed in FY 2008. The RSF is a 200,000-square-foot office building which is also being designed at the LEED Platinum level and is potentially a net zero energy building. All new construction at NREL addresses the five guiding principles of the Federal Leadership in High Performance and Sustainable Building and incorporates renewable energy into the building design to the extent feasible. New laboratory buildings also address the principles of the EPA/DOE Laboratories for the Twenty-First Century program.

NREL's policy is to maximize the use of on-site renewable energy. Multiple on-site PV and wind projects currently generate approximately 112 MWh of electricity annually. In addition, two major on-site renewable energy projects that utilize private sector financing were undertaken during FY 2007. The Renewable Fuel Heating Plant is a biomass combustion boiler that will offset an estimated 75% of the current natural gas usage of the South Table Mountain campus. The Mesa Top PV Project is a 750 kW (1,200 MWh per year) single-axis tracking PV system. Upon completion in FY 2008, this system will provide approximately 7% of NREL's annual electrical needs and contribute to the RSF's potential to be a net zero energy building.

A number of NREL hybrid owners gathered with their hybrid electric vehicles (HEVs), proving once again that NREL walks the talk when it comes to sustainability. NREL staff ownership of HEVs is 20% higher per capita than the national average.

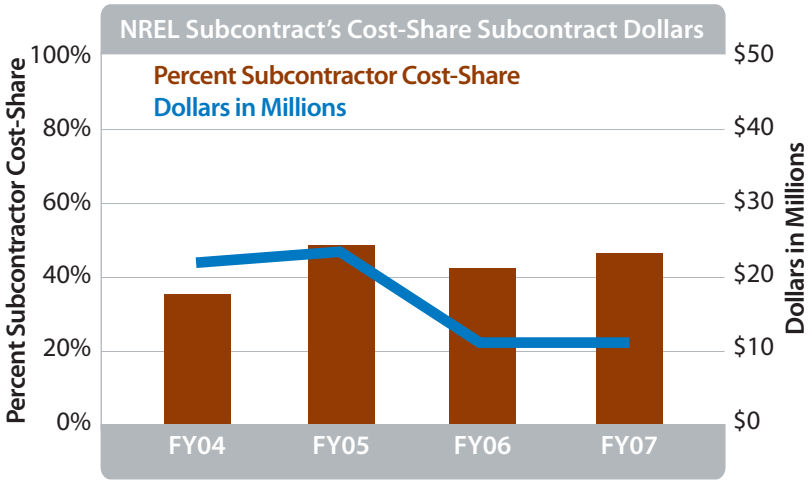
Artist's rendition of the Renewable Fuel Heating Plant being installed using an Energy Savings Performance Contract.



Artist's rendition of the Mesa Top PV Project being installed using a power purchase agreement, under which a private-sector developer owns and operates the PV system and DOE/NREL purchase the power produced by the system at a price less than the current price charged by the utility.

Contracts and Procurement

NREL's strong subcontracts and procurement processes enable the Laboratory to meet or exceed the majority of its subcontracting goals and reflect a commitment to effective and meaningful competition, socioeconomic goals, leveraging of DOE funding, and timely subcontract closeouts.

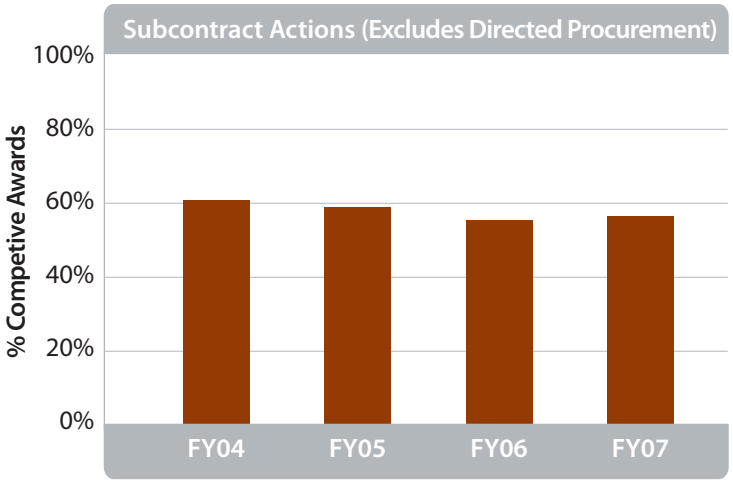


Continued high cost-sharing (47%) for subcontracts demonstrates industry's commitment and leveraging of DOE funding and EERE technologies. In FY 2007, 191 cost-share subcontracts were awarded.

The majority of NREL's subcontracts and purchase orders were placed in the last six months of the year following appropriations—a testament to the agility of NREL's systems and the commitment of its staff. Key actions included acquiring the equipment for the Process Development and Integration Laboratory, which will assist the U.S. PV industry in its commercialization activities through research support. Other key actions during this time included placing the Solar America Initiative incubator subcontracts.

Early FY 2007 budget considerations, combined with NREL's institutional priorities for acquiring research equipment, resulted in a significant increase in purchasing activity. As with subcontracts, the majority of purchase order award dollars (71%) occurred in the last 6 months of the fiscal year.

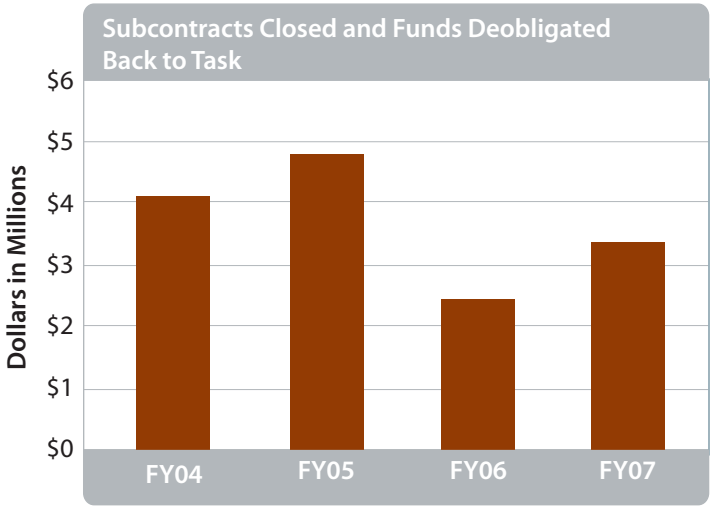
NREL successfully exceeded its competitive subcontracting goals, through 69% total award dollars and 57% of total actions being competitive in FY 2007. This demonstrates exemplary performance for a Laboratory doing complex scientific and engineering work. In addition, this activity helps NREL meet key strategic objectives, industry participation, goals, and leveraging of DOE funds.



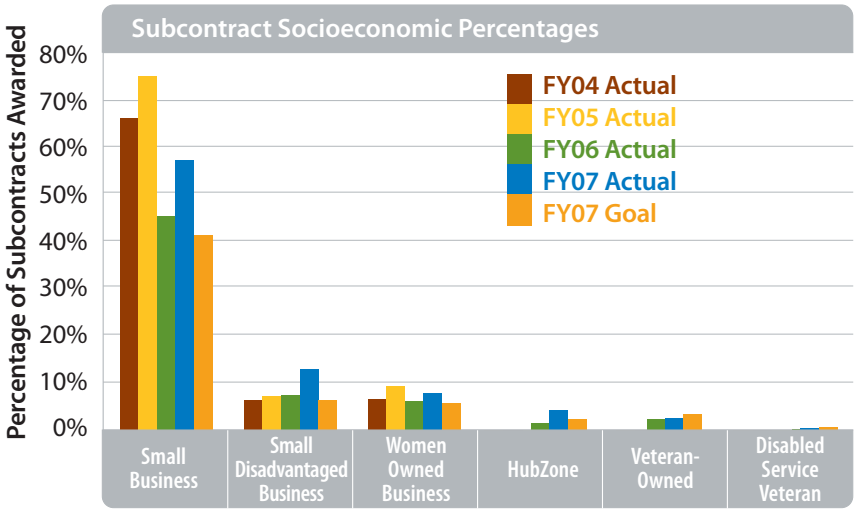
Despite budget considerations that significantly impacted funds available for subcontracts, the 57% competitive awards in FY 2007 exceeded the Laboratory's goal of awarding 55% of subcontracts competitively.

NREL continued its aggressive small-business outreach on a local level by participating in the Rocky Mountain Minority Supplier Diversity Council, the Small and Disadvantaged Opportunity Council, and the Colorado Women's Chamber. NREL's small-business development liaison continues to sit on the Board of Directors of the Rocky Mountain Minority Supplier Diversity Council and is vice president and board member of the Small and Disadvantaged Opportunity Council. NREL's participation in these outreach events continues to provide opportunities to seek out a variety of business partnerships with minority and small business concerns to help commercialize renewable energy and energy efficiency technologies.

NREL continued to apply efficient and effective processes to aggressively close out subcontracts. The Laboratory made excellent progress in closing out subcontracts with uninvoiced amounts equal to or greater than $20,000. More important, through the closeout process, $3.4 million was deobligated and returned to task for critical EERE program support.



Closing out subcontracts with unspent dollars in a timely way continues to return funds to programs.



Socioeconomic awards to small, small-disadvantaged, women-owned, and Hubzone businesses remained strong, while significant progress was made toward meeting the difficult goals of awards to veteran-owned and disabled service veteran businesses.

Human Capital

NREL recognizes that its people are its most important asset. Effective management of human capital allows the Laboratory to promote and maintain a culture that is aligned with its mission, values, and strategy.

NREL's effective management of human capital builds, sustains, and effectively deploys the skilled, knowledgeable, diverse, and high-performing workforce needed to meet the current and emerging needs of the nation.

NREL's unprecedented growth this year demanded creative solutions to the Laboratory's staffing needs. Since mid-May, 79 new employees joined the NREL team. To better meet the Laboratory's increasing demand for highly sought-after talent, NREL reevaluated and reengineered its human resources infrastructure, staffing, and processes by:

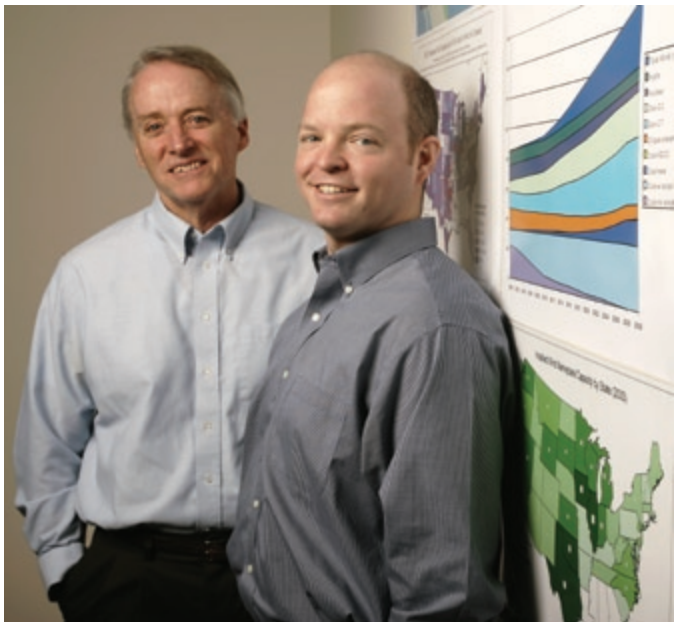
- Adding a staffing center to assist with NREL's recruiting efforts. Activities in the center include providing prescreening, checking backgrounds, and evaluating the skills and experience of job candidates to ensure that each new employee is qualified to match NREL's specific needs.
- Hiring three senior recruiters who are dedicated to recruiting and selecting the best possible employees. All three have experience sourcing candidates for a variety of high-level engineering, scientific, and research positions.
- Reengineering its staffing process to consult with management, conduct thorough prescreening of candidates, conduct first interviews for candidates, discuss each interview/candidate with the hiring manager, and extend offers.
- Obtaining DOE approval for an employee referral bonus plan, and engaging a marketing organization that specializes in recruitment advertising to promote the plan.
- Beginning to implement an electronic applicant tracking system, which will change the staffing process from a labor-intensive manual process to a more efficient electronic process.

NREL's LDRD program is a prime avenue for NREL to obtain and develop new up-and-coming scientific talent. Postdoctoral researchers from around the world are brought in to work on LDRD projects in which they have an opportunity to work with research fellows and principal investigators who mentor new scientists and researchers in critical areas. These areas include biohydrogen, photo-electrocatalytic systems, building controls, nanoscience and molecular sciences, and strategic analysis. Contributing to NREL's continuing success and elevated status in the scientific community often leads to a permanent position at the Laboratory.

In a tight job market, NREL must be able to offer competitive benefits when recruiting new employees. This year, NREL recompeted its employee medical insurance coverage, which resulted in substantial savings in medical insurance costs and new policy caps for future increases. Without this change, NREL would have faced premium increases of 15% or more. In addition, a new provider was chosen for the Laboratory's flexible spending plan, and the cost saving achieved allowed a debit card program to be added for employees.

With support from the DOE Golden Field Office, the Laboratory achieved an $8-million cost savings over an eight-year period by proactively evaluating options for funding the NREL defined benefit pension plan under the Pension Protection Act of 2006. As a result of NREL's accelerated pension plan contribution schedule under the Pension Protection Act, NREL pension liabilities will be fully funded while allowing NREL to have more predictable and less volatile future contributions and costs.

NREL launched a comprehensive management development initiative this year known as "NREL Connect–Coaching Performance." This 18-month program is designed to integrate consistent language and approaches to managing people, communicate management performance expectations, and build management camaraderie with colleagues across the Laboratory. For each of the 12 modules, executive management participates in course overviews of the training and line managers attend the full training. All principles of the training are embraced and supported at all levels.

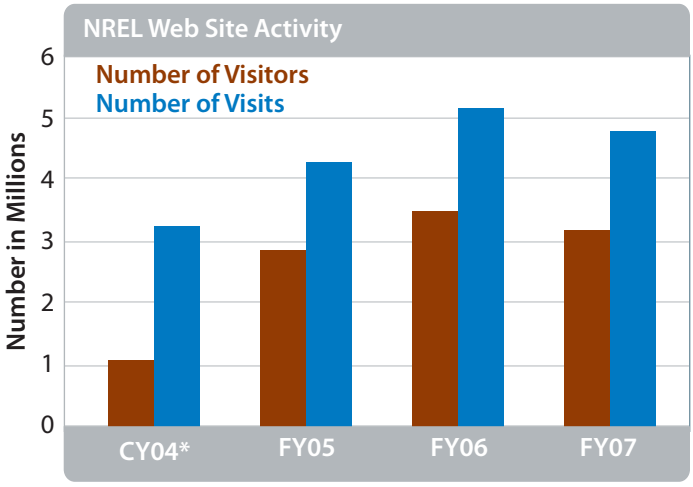


NREL encourages staff to collaborate on ideas and projects throughout its campus.

"NREL Connect–Coaching Performance" builds outstanding coaches whose legacy is the unparalleled success of NREL teams.

E-Communications and Technologies

In an age of expanding need for information about renewable energy and energy efficiency technologies, NREL utilizes leading-edge information technologies to engage and collaborate with partners and stakeholders.



* Data tracked by calendar year prior to FY 2005

The 3.2 million online visitors to the NREL Web site made a total of 4.8 million visits in FY 2007.

The use of electronic communications technologies remained steady during FY 2007. Employees created or redesigned more than 20 Web sites, and maintained many others—all of which contribute to the successful outreach efforts of NREL and DOE's EERE. In addition, NREL identified and implemented advanced electronic solutions to further enhance the understanding of technical concepts or make large amounts of data more accessible. The solutions integrated into Web sites for NREL and DOE included the development of eight new databases and a variety of videos, pod casts, animations, and blogs (Web logs). NREL's Web site (www.nrel.gov) continues to be the most popular place for visitors to learn about the Laboratory's cutting edge research.

In FY 2007, NREL produced a Web site for the DOE Renewable Energy Production Incentive (REPI) program, managed by EERE. The site is a database of projects receiving federal financial incentive payments through REPI for electricity generated from renewable energy resources that are produced and sold by municipalities. The database allows DOE staff and program participants to identify these projects, identifies the benefits of the program for other municipalities who are looking to participate, and streamlines the application process by placing the initial steps online (www.eere.energy.gov/repi/).

A Web site was also developed to support EERE's Office of Planning, Budget, and Analysis' Energy Collaborative Analysis Initiative (ECAI). ECAI is a collaborative effort among federal and state officials and research organizations to identify opportunities to work together on energy analyses that would ultimately inform and drive policy making. Activities related to the collaboration are facilitated and coordinated by NREL. Through coordination among agencies, this initiative aims to make analysis more efficient and cost-effective, increase the credibility of analytical methods, standardize assumptions and methodologies, and reduce duplication of efforts. Sixty-two analysts from 27 organizations identified eight high-priority energy topics that analysts and decision makers should address in the near future. The ECAI Web site encourages information exchange and provides current information on analysis priorities, a list of initiative participants with contact information, analysis activities by organization, and workshop information (www.nrel.gov/analysis/collab_analysis/).

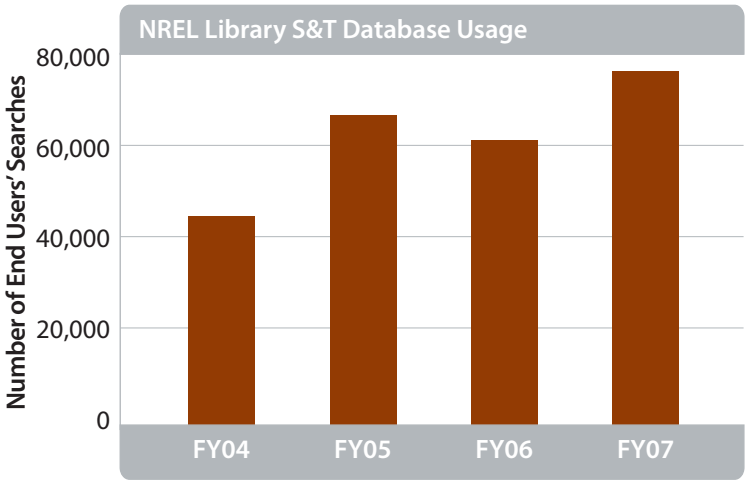
NREL continued to deliver effective business and operational support to address important requirements and implemented improvements to business processes that advance the Laboratory's strategy and address emerging requirements. NREL provided a healthy information technology (IT) infrastructure and quality technical support to a rapidly expanding number of employees, continued to improve and deploy requirements systematically, and revised its Quality Assurance Program and Implementation Plan.

Despite several equipment upgrades in the NREL data center, construction in the building housing the data center, and the rollout of a new enterprise-wide wireless network, NREL still managed to achieve more than 99.9% availability of its IT infrastructure for core services, including e-mail, telecommunications, network, anti-spam, and business applications.

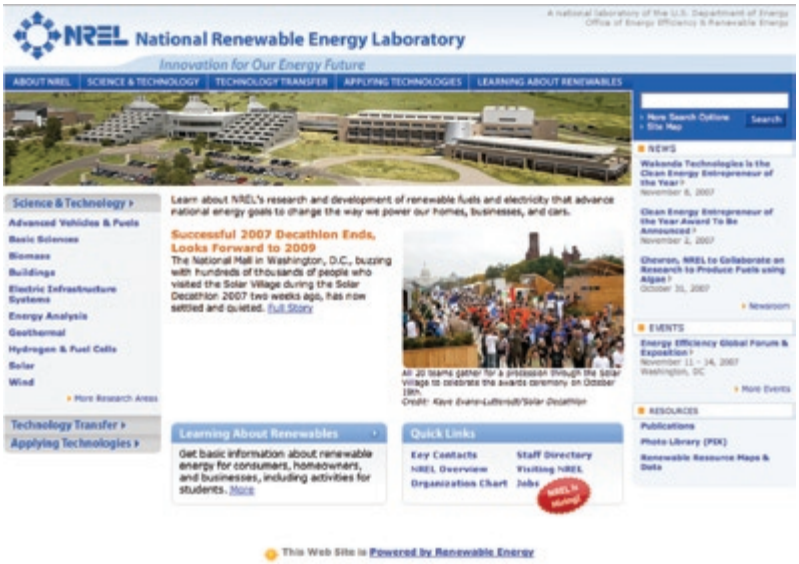
The Laboratory continued to strengthen the cyber security protecting its information technology. In FY 2007, NREL conducted a successful Security Test & Evaluation as part of the Certification & Accreditation (C&A) of the Lab's IT environment. In preparation for the C&A effort, NREL transitioned to an enclave environment, consistent with DOE Lab-complex best practices. Efforts to successfully implement sound and effective cyber security practices were recognized in June when the Laboratory received an Authority to Operate for three years (the maximum time allowed).

Database searches play an important role in the Laboratory's research and publication processes. NREL's library services provide a channel for researchers to more easily and expeditiously share their findings and access the latest research performed around the world. NREL's cost-effective online library services continued to support research and technical staff by providing access to more than 200,000 articles. To support the laboratory's publishing needs, 977 publications were added to NREL's publications database this fiscal year.

The Laboratory recognizes the value of adapting to constant and continuous changes in its environment. Business processes continue to be enhanced through the use of information technologies that improve NREL's operational efficiency and flexibility.



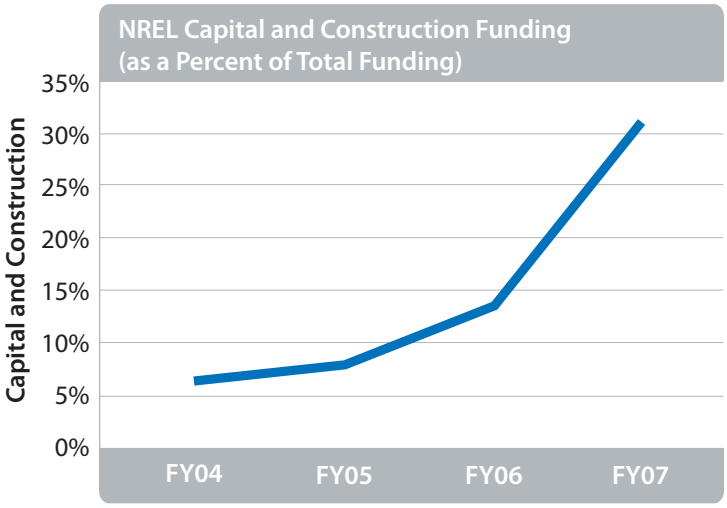
A record number of searches of major S&T databases were performed by research and technical staff, increasing desktop database usage by 19% from that of FY 2006. The increase was due in part to the implementation of Central Search, a cross-database search tool, earlier in the year.



NREL annually reports on various aspects of performance such as research accomplishments, technology transfer, and site sustainability. Please visit www.nrel.gov to learn more about work performance at the Laboratory.

Site and Facilities

The Laboratory employs a comprehensive approach to managing its campus infrastructure by balancing the maintenance of existing DOE assets with the planning and building of new capabilities.



In FY 2007, NREL received substantial construction funding for new buildings to facilitate the successful accomplishment of many DOE program objectives and help U.S. manufacturers keep pace with foreign competitors.

This cluster tool in the Process Development Integration Laboratory is an example of the critical equipment purchases made with GPE resources.

NREL enhanced its technical capabilities by effectively investing General Plant Projects (GPP) and General Purpose Equipment (GPE) capital resources in facilities and equipment. GPP-funded projects included laboratory upgrades and infrastructure enhancements. FY 2007 GPE-funded projects included equipment upgrades, infrastructure enhancement, and general purpose equipment procurements for multiprogram capabilities. For example, the first technology platform, the Silicon Platform, was delivered to NREL's Process Development Integration Laboratory (PDIL) in the Science and Technology Facility. This cluster tool conforms to new equipment design standards adopted by both NREL and industry. The design allows for various deposition, processing, and characterization tools to be integrated via a standardized transfer interface—keeping a sample under vacuum and ambient conditions while moving it from one tool to another. This particular tool focuses primarily on silicon-based materials and photovoltaic device fabrication.

A primary feature of NREL's Science and Technology Facility is the 11,400-square-foot PDIL, which provides space to configure equipment for exploring process integration options. Researchers are able to work with industry partners to find ways to move promising technologies from concept to first-time manufacturing and commercialization. The PDIL offers a new class of tools for thin-film photovoltaic deposition, processing, and characterization. Researchers can pass samples between laboratory equipment in a controlled environment, avoiding contamination and speeding the research process.

The Laboratory effectively uses available indirect resources to maintain adequate facility conditions. For example, actively managed space assignments ensured that they were adequate to successfully and safely accomplish the Laboratory's mission. Indicative of the effective utilization of space, workstation utilization was 94%, while Laboratory utilization was 97%.

NREL began implementing plans to accommodate additional staff by successfully retrofitting existing space instead of adding new facilities. However, to meet the occupancy scheduled for FY 2008, negotiations with Denver West began to lease an additional 24,000 square feet of office park space.

The Washington, D.C., office lease was successfully executed to allow NREL and Lawrence Berkeley National Laboratory to continue operations with minimal impact. Within six months of notice that the tenancy would not be renewed, NREL negotiated a new lease and completed occupancy. This was a considerable coordination challenge involving the new building owner, the building management company, two other DOE labs, and the Headquarters Office of Engineering and Construction Management.

NREL made substantial progress on the Research Support Facility (RSF) and the Integrated Biorefinery Facility by holding design charettes to capture the vision, values, and ideas of the community and short-listing the design-build firms. The RSF charrette included a project overview and brainstorming sessions on specific topics that will impact the design of the building. Small groups were tasked with providing input on a range of features, including siting the building; parking strategy; architecture and building image; engineering the building; the "design-build" approach; and the programmatic elements and amenities important to the user, including the office environment and planning for NREL's workforce of the future. Breakout sessions were facilitated by subject matter experts, including specialists in the fields of architecture and urban planning, sustainable strategies for corporations and governments, "design-build" contracts, landscape architecture, and workplace innovation.

NREL has integrated safety criteria into Construction Line Item and major project statements of work. The performance-based design-build Research Support Facility and the Integrated Biorefinery Facility statements of work include project-specific health and safety plans. For the first time, design-build team safety incentives are included in the NREL subcontract.

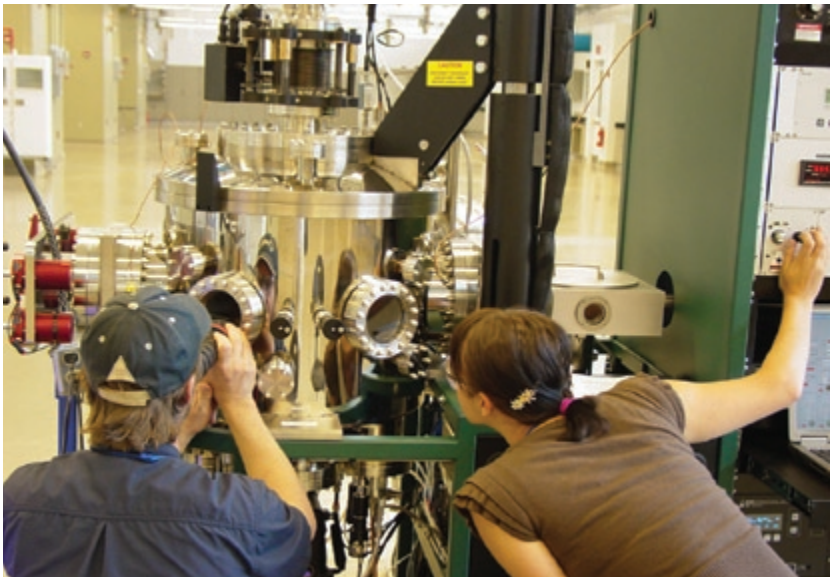
The Laboratory is incorporating an energy goal into the scope of work for future buildings. For example, the new NREL-developed zero-energy concept and energy-efficiency specifications for the RSF will be mandatory for the design-build bidders to meet in their proposals.

Flexibility, modularity, moderate cost, abundant data, multiple option evaluation, bench-scale to commercialization R&D—the DOE Thermochemical Users Facility offers industrial partners a multitude of benefits without the time and expense of building their own facility.

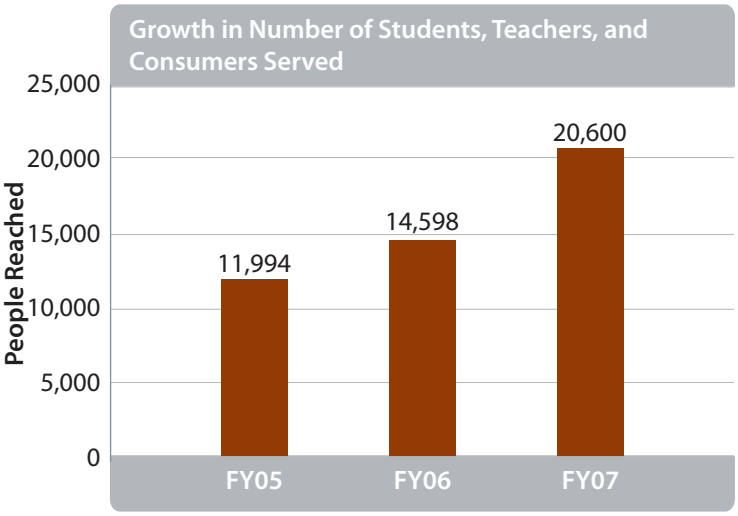
More than 70 DOE, NREL, and external subject matter experts attended the DOE/NREL Design Charrette for the Research Support Facility.

Public Responsibility

Through numerous education and outreach programs, NREL reached more educators, students, and consumers than ever before, further instilling an appreciation of science, mathematics, technology, and engineering.



An NREL mentor shares invaluable experience and knowledge of science with a summer intern.



The NREL educational program reached a record number of students, teachers, and consumers in FY 2007.

NREL's appeal as a noted R&D institution solving the nation's energy issues attracts more intern applications than any other laboratory. For example, more than 300 applications were received for the 37 DOE Office of Science-funded internships available at the Laboratory in FY 2007. The two largest undergraduate internship programs, DOE's Office of Science and the Laboratory's internal Research Participant Program, resulted in a 33% increase in summer research interns from those of FY 2006.

NREL reached more than 20,600 students, teachers, and consumers through student competitions, teacher workshops, and education events this year. This bests previous outreach results and marks a 41% growth in comparison to 2006. NREL strategically focused on three value-added areas: workforce development, outreach related to technology transfer, and the provision of renewable energy and energy efficiency research-specific resources to K–university classrooms. These areas of concentration provide a platform to reach the public while encouraging youth to consider scientific fields of study and informing students, teachers, and consumers about technological advancements.

As the Renewable Energy and Efficiency Education on Wheels (RnE^{2}EW) vehicle canvassed the nation promoting renewable energy and energy efficiency, the program's own outreach history was being made. More than 19,000

students, teachers, and consumers (of the total of 20,600) were reached in 38 events this year. This surpassed the 2006 RnE^{2}EW outreach by 30%. New audiences included community colleges and schools of the Navajo Nation in Arizona.

Aggressive expansion continued in NREL's science literacy program in FY 2007. The Coalition of Learning Opportunities and United Tutors (CLOUT) program was in 14 very diverse high-needs schools, where it supported 139 students, 63 tutors, and 22 coordinating teachers. This year-long program promotes best practices of one-on-one tutoring with students, hands-on science, and reading to introduce science topics. Given the DOE and NREL goals of increasing diversity in the workforce of the future, it is impressive that 94% of the students participating in this program in support of reading are students of color.

In support of DOE's wind program, NREL is engaging rural America in a discussion of wind energy while developing a knowledge base through its Wind for Schools project. The objectives of the project are to engage rural school teachers and students in wind energy education, equip college students with wind energy applications and education to provide the growing U.S. wind industry with interested and qualified professionals, and introduce wind energy on a small scale in rural communities to start discussions of the benefits and issues of using wind energy.

RnE^{2}EW proves to be an effective way to take renewable energy and energy efficiency science to students, teachers, and the community.

CLOUT tutoring program participants explore science and technology at NREL's Visitors Center.

National Renewable Energy Laboratory

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